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NATIONAL AIR SAMPLING NETWORK

ENVIRONMENTAL PROTECTION AGENCY

1975

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17. Key Words and Document Analysis. 17a. Descriptors

*Sulfur dioxide
*Nitrogen dioxide
Sulfates
Nitrates
Sites
Monitoring
Particles
Concentration(Composition)
Samples
Calibrating
Measuring instruments
Standards
Gas analysis
Bubbles
Tables(Data)
Ammonia
Organic compounds

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*Air quality data
*Air pollution monitoring
Monitors

17c. COSATI Field Group 13B, 14B

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NATIONAL AIR SAMPLING NETWORK
STATUS REPORT
1975

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
Denver, Colorado

Prepared By Barry Levene

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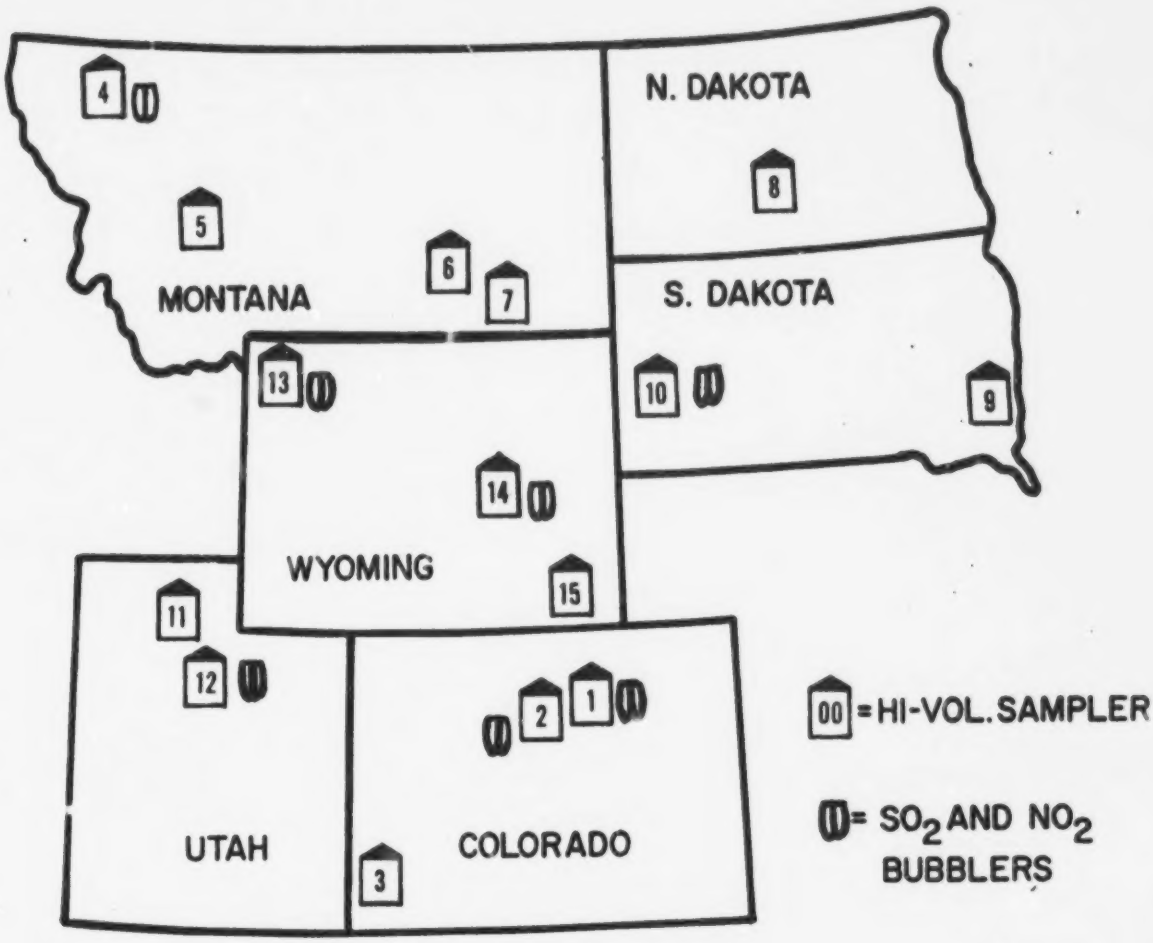
I. INTRODUCTION

This report presents a region-wide summary of air monitoring sites which are part of the National Air Sampling Network (NASN). The network in Region VIII consists of fifteen sites, all of which contain one high volume sampler to measure total suspended particulate, and seven of which have, in addition, gas bubblers to measure ambient concentrations of SO_2 and NO_2. Many of the sites have been in operation since the late 1950's, providing some of the best historical data obtainable regarding pollutant concentrations in urban and remote areas. Nine of the sites are in urban areas; six are located in remote areas to provide background data. The map on the following page shows site locations and indicates the type of sampling occurring at each.

Since January 1974, the EPA Regional Office in Denver has been responsible for network operation, maintenance, and calibration of equipment. The operators of the sites are volunteers from the Forest Service, National Park Service, or State or local air pollution agencies. A list of all operators and their addresses is found in Appendix A. All necessary supplies, including filters and bubblers, are sent to the operators by the EPA Regional Laboratory and samples are returned to the Laboratory after sampling has occurred. Samples are run from midnight to midnight (24-hours) on the days indicated by the 6-day sampling schedule (see Appendix B). Sixty sampling days were scheduled in 1975. The Laboratory analyzes the samples according to standard methods and reports concentrations in micrograms per cubic meter of air ($\mu g/m^3$). Twice each year, EPA personnel inspect the sites, replace worn equipment and calibrate the instruments. EPA also provides repair service if equipment fails at any time.

LOCATION OF NASN SITES IN REGION VIII



1. Denver - CAMP
2. Denver - School Administration
*3. Mesa Verde National Park
*4. Glacier National Park
5. Helena
*6. Ft. Howes
*7. Ashland
8. Bismarck
9. Sioux Falls
*10. Black Hills
11. Ogden
12. Salt Lake City
*13. Yellowstone National Park
14. Casper
15. Cheyenne

*Remote or rural site

Further analyses are done on every other filter from each site by EPA's Environmental Monitoring and Support Laboratory in Research Triangle Park, North Carolina. Filters are analyzed for nitrates, sulfates, ammonia, and organics. Data through 1973 are available at the Regional Office and 1974 data will be available as soon as they are validated. All filters are stored in a filter bank for future reference and special studies.

II. SUMMARY OF EVENTS IN THE NASN (1975)

A. Site Visits

Each site was inspected and calibrated twice in 1975, once in midwinter and again in midsummer by Rick Chartier, the EPA Region VIII NASN Contact. No significant equipment problems were encountered.

B. Status Board

To track incoming samples from the sites, two status boards were constructed. One is maintained at the Regional Laboratory and the other by the EPA Region VIII NASN Contact. The status board is a chart on which each sample is tracked by color-coded dots. Three conditions are possible: (1) A valid sample has been received and analyzed by the laboratory, (2) a sample was received but voided for some reason by laboratory personnel, and (3) no sample was received. By maintaining an up-to-date board, it becomes immediately evident when trouble exists somewhere in the network, and the problem can be corrected before a long period of time has passed.

There are two criteria for determining that a quarter of data is valid: (1) There must be five or more samples during the three-month period, and (2) if one month has no samples, then the other two months must have at least two samples each. If these criteria are not met, then the quarter is said to be invalid. If one quarter is invalid, any statistics (means or maximums) calculated for the year including that invalid quarter are considered to be questionable. It is essential, then, that the minimum number of samples be secured each quarter. The status board can assist in assuring this minimum number.

C. Sites Transferred to State Control

During 1975, the operation of the Bismarck site was transferred to the state. Since March 1, 1975, the North Dakota Department of Environmental Quality has been in charge of site operation and sample analysis, as if the site were a part of the state network. Data were reported to EPA as part of the state's quarterly report. EPA will continue to supply all necessary materials and equipment.

On January 1, 1976, the site in Casper was turned over to the State of Wyoming Department of Environmental Quality to be operated in a similar manner to the Bismarck site.

III. SUMMARY BY SITE

A. Data Tables

The tables on pages 10-24 summarize data from NASN sites in Region VIII excluding Bismarck. Raw data are available on request. There are 15 tables, one for each site, and one summarizing all sites. The statistics used in the tables are those most often used to evaluate air quality at a site and can be directly related to ambient air quality standards as set by EPA. The absence of values in the SO_2 or NO_2 columns means that no bubblers are present at the site.

In some cases insufficient data or inadequate distribution of data throughout the year makes some of the calculated statistics questionable. For example, if three months of data are missing during a season when high concentrations would be expected, the yearly maximum and the average would not tell the complete story of air quality at that site. Therefore, criteria stated previously are used to determine whether or not the statistics based on available data are valid.

All statistics which are calculated with one invalid quarter are footnoted and are considered somewhat questionable. All statistics calculated using two or more invalid quarters are footnoted and are considered highly questionable.

B. Data Sufficiency

1. Hi-vol Network

Out of a possible 840 sample-days for all hi-vol sites, only 569 samples

or 68% were valid. Missing samples accounted for 23% and voided samples were 9%.

The problem of missing data was extreme during the first 6 months of 1975 but improved dramatically during the second half of the year. Several sites accounted for much of the missing data. Sites with more than one-third of the data missing include Denver School Administration site, Helena, Ft. Howes, Sioux Falls and Cheyenne.

Voided samples seem to be distributed evenly among all sites with those sites recording the largest number of valid samples also recording the largest number of voided samples. The percent of samples voided by the Laboratory for any reason ranged from a low of 2% at Ogden to a high of 24% at Yellowstone.

2. Gas Bubbler Network

Out of a total of 420 sample-days, 361 or 86% were valid for SO_2 and 360 or 86% were valid for NO_2.

The sites at Casper and Denver School Administration account for more than 90% of the missing samples for both pollutants. Voided samples were fairly evenly distributed with the two Denver sites recording the highest percentages.

3. Overall Network

The sites with the best records for 1975 are the Denver CAMP site, Glacier, Black Hills, and Salt Lake City. All of these sites averaged 80% or more valid data.

C. Data Summary

1. Urban Sites

High TSP values occur at the urban sites in Denver, Salt Lake City,

Ogden, and Sioux Falls. The two Denver stations, however, are the only ones which exceeded the annual standard of 75 $\mu g/m^3$. The Denver CAMP site is the only site in the Region which exceeded the 24-hour standard of 260 $\mu g/m^3$ which is not to be exceeded more than once per year. Fifteen percent of the samples were above standard.

None of the sites in the bubbler network recorded values above standard. The highest value for SO_2 at Salt Lake City, was 137 $\mu g/m^3$, far below the 24-hour standard of 365 $\mu g/m^3$.

b. Rural Sites

The highest TSP reading was 62 $\mu g/m^3$ at Yellowstone, and the highest annual geometric means occurred at Ashland and Black Hills, both were less than 11 $\mu g/m^3$.

Both SO_2 and NO_2 were extremely low, almost all values were at or below the minimum detectable level, which is 5 $\mu g/m^3$ for NO_2 and 26 $\mu g/m^3$ for SO_2.

Summary of All Sites
1975

	TSP	SO_2	NO_2
Total possible values	840	420	420
No. of valid samples	569	361	360
(% of total)	68%	86%	86%
No. of void samples	78	29	31
(% of total)	9%	7%	7%
No. of missing samples	193	30	29
(% of total)	23%	7%	7%
No. of sites with 4 valid quarters	6	5	5
No. of sites with 3 valid quarters	6	2	2
No. of sites with less than 3 valid quarters	2	0	0

Annual Summary By Site
1975

Site Location: School Administration Building
414 14th Street
Denver, Colorado

Site Number: 06 0580 001 P01

	TSP	SO_2	NO_2
No. of Valid Samples	32	40	39
No. of Void Samples	7	7	10
No. of Missing Samples	21	13	11
Maximum Value(ug/m^3)	366[b]	24[b]	90[b]
2nd Maximum Value(ug/m^3)	249[b]	15[b]	87[b]
Annual Mean[a](ug/m^3)	90.2[b]	4.8[b]	43.9[b]

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[b]Based on one quarter of data which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: Continuous Air Monitoring Station
2105 Broadway
Denver, Colorado

Site Number: 06 0580 002 P01

	TSP	SO_2	NO_2
No. of Valid Samples	54	54	53
No. of Void Samples	3	6	6
No. of Missing Samples	3	0	1
Maximum Value(ug/m^3)	397	64	100
2nd Maximum Value(ug/m^3)	369	62	93
Annual Mean[a](ug/m^3)	122	16.3	60.4

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

Annual Summary By Site
1975

Site Location: Mesa Verde National Park
Colorado

Site Number: 06 1530 002 P03

	TSP	SO_2	NO_2
No. of Valid Samples	48		
No. of Void Samples	4		
No. of Missing Samples	8		
Maximum Value(ug/m^3)	32		
2nd Maximum Value(ug/m^3)	30		
Annual Mean[a](ug/m^3)	6.9		

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

Annual Summary By Site
1975

Site Location: St. Mary Ranger Station
Glacier National Park
Montana

Site Number: 27 0570 001 P03

	TSP	SO_2	NO_2
No. of Valid Samples	39	58	55
No. of Void Samples	7	2	5
No. of Missing Samples	14	0	0
Maximum Value(ug/m^3)	38[b]	10	8
2nd Maximum Value(ug/m^3)	29[b]	10	8
Annual Mean[a](ug/m^3)	3.0[b]	2.5	2.85

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[b]Based on one quarter of data which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: Cogswell Building
1401 Lockey
Helena, Montana

Site Number: 27 0720 001 P01

	TSP	SO_2	NO_2
No. of Valid Samples	33		
No. of Void Samples	5		
No. of Missing Samples	22		
Maximum Value(ug/m^3)	103[c]		
2nd Maximum Value(ug/m^3)	69[c]		
Annual Mean[a](ug/m^3)	30.9[c]		

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[c]Based on two or more quarters which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: Ft. Howes Ranger Station
Custer National Forest
Montana

Site Number: 27 1240 008 P03

	TSP	SO_2	NO_2
No. of Valid Samples	35		
No. of Void Samples	6		
No. of Missing Samples	19		
Maximum Value(ug/m^3)	50[c]		
2nd Maximum Value(ug/m^3)	44[c]		
Annual Mean[a](ug/m^3)	8.3[c]		

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[c]Based on two or more quarters which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: Ashland Ranger District
Ashland, Montana

Site Number: 27 1360 026 P03

	TSP	SO_2	NO_2
No. of Valid Samples	31		
No. of Void Samples	3		
No. of Missing Samples	26		
Maximum Value(ug/m^3)	56[b]		
2nd Maximum Value(ug/m^3)	47[b]		
Annual Mean[a](ug/m^3)	10.9[b]		

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[b]Based on one quarter of data which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: Teepee Work Center
Black Hills National Forest
South Dakota

Site Number: 43 0110 001 P03

	TSP	SO_2	NO_2
No. of Valid Samples	46	57	57
No. of Void Samples	10	3	3
No. of Missing Samples	4	0	0
Maximum Value(ug/m^3)	40	19	7
2nd Maximum Value(ug/m^3)	37	13	7
Annual Mean[a](ug/m^3)	10.3	3.4	3.5

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

Annual Summary By Site
1975

Site Location: City Hall
224 West 9th
Sioux Falls, South Dakota

Site Number: 43 1480 001 P01

	TSP	SO_2	NO_2
No. of Valid Samples	34		
No. of Void Samples	1		
No. of Missing Samples	25		
Maximum Value(ug/m^3)	287[b]		
2nd Maximum Value(ug/m^3)	165[b]		
Annual Mean[a](ug/m^3)	49.8[b]		

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[b]Based on one quarter of data which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: Health Department Building
2570 Grand Avenue
Ogden, Utah

Site Number: 46 0680 001 P01

	TSP	SO_2	NO_2
No. of Valid Samples	43		
No. of Void Samples	1		
No. of Missing Samples	16		
Maximum Value(ug/m^3)	228[b]		
2nd Maximum Value(ug/m^3)	152[b]		
Annual Mean[a](ug/m^3)	65.0[b]		

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[b]Based on one quarter of data which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: Health Department
610 S. 2nd East
Salt Lake City, Utah

Site Number: 46 0920 001 P01

	TSP	SO_2	NO_2
No. of Valid Samples	55	55	54
No. of Void Samples	3	4	5
No. of Missing Samples	2	1	1
Maximum Value(ug/m^3)	194	137	113
2nd Maximum Value(ug/m^3)	180	84	104
Annual Mean[a](ug/m^3)	62.3	15.3	53.9

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

Annual Summary By Site
1975

Site Location: Mammoth Area
Yellowstone National Park
Wyoming

Site Number: 52 0860 001 P03

	TSP	SO_2	NO_2
No. of Valid Samples	45	57	58
No. of Void Samples	14	3	2
No. of Missing Samples	1	0	0
Maximum Value(ug/m^3)	62	12	8
2nd Maximum Value(ug/m^3)	27	9	6
Annual Mean[a](ug/m^3)	4.8	2.5	2.4

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[b]Based on one quarter of data which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: State Office Building
23rd and Central Avenue
Cheyenne, Wyoming

Site Number: 52 0140 001 P01

	TSP	SO_2	NO_2
No. of Valid Samples	32		
No. of Void Samples	4		
No. of Missing Samples	24		
Maximum Value(ug/m^3)	80[b]		
2nd Maximum Value(ug/m^3)	74[b]		
Annual Mean[a](ug/m^3)	33.5[b]		

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

[b]Based on one quarter of data which do not meet the validity criteria.

Annual Summary By Site
1975

Site Location: City and County Building
Center and C Streets
Casper, Wyoming

Site Number: 52 0120 001 P01

	TSP	SO_2	NO_2
No. of Valid Samples	42	40	44
No. of Void Samples	10	4	0
No. of Missing Samples	8	16	16
Maximum Value(ug/m^3)	120	17[b]	30[b]
2nd Maximum Value(ug/m^3)	100	8[b]	26[b]
Annual Mean[a](ug/m^3)	47.7	2.45[b]	6.0[b]

[a]Arithmetic for SO_2 and NO_2; geometric for TSP

APPENDIX A

NASN Site Operators

TELEPHONE LIST
NASN OPERATORS - 2/2/76

Mr. Ron Phillips, Carl Broadhead (2)
Bureau of Air Qual.
Air Qual. Shop
261 W. 5th. South
SLC, Utah 84101
533-6110
*8-588-5500

Mr. Chuck Garda (2)
Continuous Air Monitoring Station
2105 Broadway
Denver, CO 80205
837-3601

Mr. John O'Neal (2)
Yellowstone Nat'l Park
WY 82190
344-7381
*8-328-1110

Mr. Eric Highberger (1)
DEQ Air Qual. Div.
Hathaway Bldg.
Cheyenne, WY 82002
777-7391
*8-328-1110

Mr. Ron Meyer (1)
Chief Ranger Office
Mesa Verde National Park
CO 81330
529-4469
*Depends 3131 for DFC or
327-0111 Denver

Mr. Loyd Kordge (2)
Glacier Nat'l. Park
Browning, MT 59417
732-4591
*8-585-5011

Mr. John Lawrence (1)
Montana State Dept of Health
& Environmental Science
Cogswell Building
Helena, MT 59601
8-587-3454

Mr. T.H. Olson (1)
Sioux Falls Health Dept.
224 W. 9th. Street
Sioux Falls, SD 57102
339-7075
*8-782-4980

Mr. Chas. McGlothlin (1)
Ashland Dist. Ranger
P.O. Box 168
Ashland, MT 59003
Station, 784-2344
Office, 8-585-6361
*8-585-5011

Mr. Ken Sallee (2)
640 S. Summit
Elk Mt. Ranger District
Black Hills Nat'l. Forest
Newcastle, WY 82701
Office, 746-2783
*8-328-1110

Mr. Richard A. Schwartz (1)
Weber Co. Health Dept.
2570 Grant
Ogden, UT 84401
399-8381
*8-586-6011

Mr. Robert Minerod (1)
District Ranger
Fort Howes Ranger Station
Ashland, MT 59003
784-2312
*8-585-5011

Mr. Rich Young (2)
Air Pollution Control Section
Denver Dept. of Health &
Hospitals
605 Bannock St.
Denver, CO 80204
893-6243

*FTS operator
(1) Hi vol only
(2) Both Hi vol and gas bubbler

APPENDIX B

1975 Sampling Schedule

1975 SAMPLING SCHEDULE

(Every 6th Day)

QUARTER 1

January	February	March
6	5	1
12	11	7
18	17	13
24	23	19
30		25
		31

QUARTER 2

April	May	June
6	6	5
12	12	11
18	18	17
24	24	23
30	30	29

QUARTER 3

July	August	September
5	4	3
11	10	9
17	16	15
23	22	21
29	28	27

QUARTER 4

October	November	December
3	2	2
9	8	8
15	14	14
21	20	20
27	26	26